

## ABSTRACT

In one aspect, the present invention provides a system for methods of producing and releasing hydrogen from hydrogen storage compositions having a hydrogenated state and a dehydrogenated state. In the hydrogenated state, such a composition comprises a hydride and a hydroxide. In a dehydrogenated state, the composition comprises an oxide. A first reaction is conducted between a portion of the hydride and water to generate heat sufficient to cause a second hydrogen production reaction between a remaining portion of the hydride and the hydroxide.